What is claimed is:

1. A method of modulating multilevel data arrays for storage in multidimensional storage media, said method comprising:

receiving a 2-dimensional multilevel data array in which each entry in said multilevel data array has one of a plurality of multilevel values;

generating a multilevel sequence of random numbers wherein each number in said multilevel sequence of random numbers comprises one of said multilevel values;

performing at least one of an arithmetic and a logic operation between elements of said multilevel data array and respective random numbers, from said multilevel sequence of random numbers, in order to produce an intermediate data array providing non-correlation and an even distribution of the multilevel symbols.

2. The method according to claim 1, further including the step of performing a q-ary complementary method to substantially equalize the energy associated with said intermediate data array, said multilevel data array having q levels.

3. The method according to claim 1, wherein said sequence of random numbers is generated using a formula and a seed.

4. The method according to claim 3, wherein said sequence is reproduced by using said formula by the presentation of said seed.

5. The method according to claim 3, wherein said sequence of random numbers is generated by using the formula:

$$Z_i = (aZ_{i-1} + c)(\text{mod } m)$$

wherein m(the modulus), a (the multiplier), c (the increment), and Z_0 (the seed) are non-negative integers.

6. The method according to claim 1, wherein said sequence of random numbers is transformed into a multilevel array of random numbers having a same size as said multilevel data array.

7. The method according to claim 1, wherein a modulo-q addition operation is performed between respective elements of said multilevel data array and a q-level array of random numbers in order to produce an intermediate data array showing non-correlation and an even distribution of said multilevel symbols.

8. The method according to claim 7, further including :

checking said intermediate data array for whether there is a large difference between the numbers of said multilevel symbols; and

using a different seed to generate a random number if the difference is said large difference.

9. The method according to claim 4, wherein said seed is encoded in a multilevel redundant format to minimize data errors, said multilevel redundant format being appended as an additional column or row to said multilevel data array.

10. The method according to claim 7, further comprising generating a control data array $C_{i,j}$, where the elements of said control data array are (q-1) for the first 'ii' elements, in a row-by-row readout order, and a remainder of said control data array is 'O's', wherein 'ii' is selected such that when an output array is produced using the formula:

$$V_{out} = |C_{i,j} - V'_{in}|$$

wherein V'_{in} is said intermediate data array, such that said output array comprises a sum equal to a situation when the sum of all the symbols in said multilevel data array have an exact middle level value.

11. The method according to claim 10, further comprising storing an index which indicates the value of 'ii', wherein 'ii' is the number of symbols that have been complemented.

12. The method of claim 11, wherein at least one of a row and a column of said output array are used to store an indices used to indicate seed information and 'ii' of said control data array $C_{i,j}$.

13. A method according to claim 2, further including producing an output data array in accordance with the function:

$$V_{out} = |C_{i,j} - V_{in} \oplus_q M(q, Z_O)| .$$

14. The method according to claim 1, further comprising ouputing a multilevel output data array, and wherein said method of modulating multilevel data arrays for storage in multidimensional storage media is utilized in a process for storing at least one page of data in a multidimensional memory.

15. The method according to claim 14, wherein said multilevel output data array is used to control a spatial light modulator for recording said multilevel output data array in a holographic strorage media.

16. The method according to claim 15, further comprising:

reading a page of data from said multidimensional memory; and

comparing said read page of data with said at least one page of data that was stored in said multidimensional memory; if a predetermined difference between said

read page and said stored page exists, then repeating storing said page of data in said multidimensional memory.

17. A modulator for modulating multilevel data arrays for storage in a multidimensional storage device, said modulator comprising:

a data port for receiving a 2-dimensional multilevel data array, each entry in said multilevel data array has a multilevel value;

a random number generator for generating a multilevel sequence of random numbers wherein each said random number in said sequence of random numbers is created by using respective multilevel values from said entries in said multilevel data array;

computing means for computing an arithmetic or logic operation on respective entries from said multilevel data array and said sequence of random numbers in order to produce an intermediate data array providing a non-correlation and an even distribution of multilevel values.

18. The modulator according to claim 17, wherein said computing means is adapted to perform a q-ary complementary for substantially equalizing the energy of the intermediate data array; wherein there are q levels.

19. The modulator according to claim17, wherein said random number generator comprises an arithmetic linear congruential random number generator for generating random numbers with uniform distribution over the interval [0,1].

20. The modulator according to claim 17, wherein said random number generator uses a formula and a seed such that a sequence can be reproduced using said formula and said seed.

21. The modulator according to claim 20, wherein said formula is:

$$Z_i = (aZ_{i-1} + c)(\text{mod } m)$$

wherein m (the modulus), a (the multiplier), c (the increment), and Z_0 (the seed) are non-negative integers.

22. The modulator according to claim 17, wherein said computing means is operable to transform said random number into a multilevel array of random numbers having the same dimensions of said multilevel data array.

23. The modulator according to claim 22, wherein said computing means is adapted to perform a modulo-q addition operation between respective entries of said multilevel data array and said multilevel array of random numbers in order to produce said intermediate data array.

24. The modulator according to claim 23, wherein said computing means is operable to check said intermediate array for a greater than a predetermined difference between the numbers of different multilevel symbols; if said greater than said predetermined difference exists, then said computing means instructs a new seed to be provided to said random number generator so that another random number data array is generated.

25. The modulator according to claim 24, wherein said computing means is operable to encode said seed in a multilevel redundant format for minimizing errors, said encoded seed is appended as additional column or row to an output modulated data array.

26. The modulator according to claim 18, wherein said computing means is operable to generate a control data array $C_{i,j}$, wherein the elements of said control data array $C_{i,j}$ are (q-1) for the first 'ii' elements, in a row-by-row readout order, and the remainder of said control data array $C_{i,j}$ is '0's'; said computing means is operable to select 'ii' so that when the final modulated output data array is produced using a formula:

$$V_{out} = |C_{i,j} - V'_{in}|$$

said final modulated output data array has a sum equal to a sum when all elements in said multilevel data array have an exact middle level value.

27. The modulator according to claim 26, further comprising an index for indicating the value of 'ii' and the number of symbols that have been complimented.

28. The modulator according to claim 17, wherein said computing means performs a transfer function according to the equation:

$$V_{out} = |C_{i,j} - V_{in} \oplus_q M(q, Z_O)|.$$

29. A system for storing pages of multilevel data in a multidimensional memory, said system comprising a modulator, said modulator comprising:

a data port for receiving a 2-dimensional multilevel data array, each entry in said multilevel data array has a multilevel value;

a random number generator for generating a multilevel sequence of random numbers wherein each said random number in said sequence of random numbers is created by using respective multilevel values from said entries in said multilevel data array;

computing means for computing an arithmetic or logic operation on respective entries from said multilevel data array and said sequence of random numbers in order to produce an intermediate data array providing a non-correlation

and an even distribution of multilevel values.

30. The system of claim 29, further comprising a feedback loop, operable during recoding of said multilevel data array into said multidimensional memory, said multidimensional memory being a holographic medium, said feedback loop reading out a page of data from said holographic medium after said a page has been recorded, then comparing the difference between said read out page and said multilevel data array in order to determine differences between said multilevel data array and said read out page.